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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/998,277 | 11/30/2001 | Ned T. Stetson | HS-109 | 6717 |
| 7590 01/16/2004 Energy Conversion Devices, Inc. 2956 Waterview Dr. Rochester Hills, MI 48309 | | | EXAMINER MORILLO, JANEL A | |
| | | | ART UNIT 1742 | PAPER NUMBER |

DATE MAILED: 01/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/998,277

Applicant(s)

STETSON ET AL.

Examiner

Janelle Combs-Morillo

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 October 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 and 18-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 and 18-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 111803.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 9-16, 18-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 9 (as well as claims 10-16 and 18-22) state the hydrogen storage material "comprises" a given composition. Claim 1, on which claim 9 is dependent upon, is drawn to an alloy "consisting essentially of" various elements in particular ranges. This is inconsistent. The examiner suggests changing "comprises" in claim 9 (as well as claims 10-16 and 18-22) to -- consisting essentially of--. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-4, 7, 8, and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Namamura (US 5,851,690).

The instant invention (claim 1) recites a composition: $Ti_{0.55-1.05}Zr_{0.05-0.35}Al_{0.32-1.8}Mn_{0-1.78}Cr_{0-1.1}$,

which converts to-

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| given numbers | min | max |
|---------------|------|------|
| Q | 0.9 | 1.1 |
| X | 0.05 | 0.35 |
| Y | 0.32 | 1.8 |
| Z | 1.8 | 2.1 |
| W | 0 | 1.1 |

| | ratios | | atomic% | |
|---------|--------|------|---------|----------|
| element | min. | max. | min at% | max. at% |
| Ti | 0.55 | 1.05 | 9.9% | 73.9% |
| Mn | 0 | 1.78 | 0.0% | 65.9% |
| Zr | 0.05 | 0.35 | 0.9% | 28.7% |
| A | 0.32 | 1.8 | 7.0% | 75.0% |
| Cr | 0 | 1.1 | 0 | 54.5% |

Table 1 (alloy from claim 1)

Accordingly, instant claims 3-6 were also converted to atomic%, as stated in Table 2 below.

| element | claim 1 | | claim 3 | | claim 4 | | claim 5 | | claim 6 | |
|---------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|
| | min at% | max. at% | min at% | max. at% | min at% | max. at% | min at% | max. at% | min at% | max. at% |
| Ti | 9.9% | 73.9% | 12.5% | 70.4% | 13.4% | 70.4% | 11.7% | 61.8% | 12.5% | 58.3% |
| Mn | 0.0% | 65.9% | 0.0% | 61.4% | 0.0% | 60.3% | 0.0% | 55.6% | 0.0% | 51.9% |
| Zr | 0.9% | 28.7% | 1.7% | 16.4% | 1.7% | 12.3% | 1.0% | 23.3% | 1.1% | 21.9% |
| A | 7.0% | 75.0% | 7.3% | 69.2% | 7.4% | 67.9% | 13.0% | 66.7% | 15.2% | 62.5% |
| Cr | 0.0% | 54.5% | 0 | 49.5% | 0 | 48.5% | 0 | 47.8% | 0 | 45.8% |

Table 2 (summary of instant claims 1, 3-6 converted to at%)

As stated in Table 3 below, Nakamura teaches a Ti-Zr-Mn Laves phase (abstract, column 2 lines 61-62) hydrogen storage alloy that falls within the presently claimed ranges (Nakamura at example 11, see also example 11a). Nakamura broadly teaches a composition-

$Ti_{1-x-z}\alpha_zY_xMn_{y-w}\beta_w$, which is equivalent to $Ti_{0.4-0.95}Zr_{0-0.4}Y_{0.05-0.2}Mn_{0.75-2}\beta_{0-1}$ where beta= V, Cr, Ni, Fe, and/or Al (column 6 lines 44-49).

| element | ratio | at% |
|---------|-------|--------|
| Ti | 0.9 | 30.0% |
| Mn | 1.7 | 56.7% |
| Zr | 0.1 | 3.3% |
| V | 0.3 | 10.0% |
| total | 3 | 100.0% |

Table 3 (Nakamura example)

Therefore it is apparent that the composition taught by Nakamura falls within the instant ranges (claims 1-4), and therefore anticipates said claims.

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Concerning dependent claims 7 and 8, as stated above, Nakamura teaches that said alloy is a C14 (AB2) type of hydrogen storage alloy.

Concerning dependent claim 23, Nakamura teaches that said alloy can be in powder form (column 4 lines 13-15).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-8, 10, 12, 15, 16, and 18-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al (US 5,888,317 A).

Lee teaches an hydrogen storage alloy $\text{Ti}_{0.7-1}\text{Zr}_{0-0.3}\text{Mn}_{1-1.3}\text{Cr}_{0.1-0.4}\text{V}_{0-0.3}\text{X}(\text{Fe, Al, Ni})_{0-0.2}$,

wherein said alloy has a C14 structure, and when converted to at% (see Table 4 below), overlaps the instant alloying ranges (claims 1-6, 10, 12, 15, 16, and 18-22, see Table 5 below).

| element | given ratios | | atomic% | |
|----------------|--------------|------|---------|----------|
| | min. | max. | min at% | max. at% |
| Ti | 0.7 | 1 | 21.9% | 47.6% |
| Mn | 1 | 1.3 | 31.3% | 61.9% |
| Zr | 0 | 0.3 | 0.0% | 14.3% |
| V Fe Al Ni (A) | 0 | 0.5 | 0.0% | 21.7% |
| Cr | 0.1 | 0.4 | 3.1% | 19.0% |

Table 4: Lee Ti-Mn hydrogen storage alloy in at%

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Concerning claims 9-22:

| | Ti | Zr | Mn | V | Ni | Cr | Fe | Al | total A |
|----|-------|-------|-------|-------|------|-------|-------|------|---------|
| 9 | 29.9% | 3.3% | 43.2% | 15.0% | 8.6% | 0.0% | 0.0% | 0.0% | 23.6% |
| 10 | 26.6% | 6.6% | 41.5% | 13.3% | 0.0% | 10.0% | 2.0% | 0.0% | 15.3% |
| 11 | 26.6% | 6.6% | 41.5% | 13.3% | 0.0% | 0.0% | 12.0% | 0.0% | 25.2% |
| 12 | 23.6% | 10.1% | 50.5% | 10.1% | 5.7% | 0.0% | 0.0% | 0.0% | 15.8% |
| 13 | 26.6% | 6.6% | 43.2% | 15.0% | 8.6% | 0.0% | 0.0% | 0.0% | 23.6% |
| 14 | 31.6% | 1.7% | 43.2% | 15.0% | 8.6% | 0.0% | 0.0% | 0.0% | 23.6% |
| 15 | 30.0% | 3.3% | 42.7% | 10.0% | 5.7% | 8.3% | 0.0% | 0.0% | 15.7% |
| 16 | 26.7% | 6.7% | 43.7% | 8.3% | 4.7% | 10.0% | 0.0% | 0.0% | 13.0% |
| 31 | 30.0% | 3.3% | 20.0% | 6.7% | 4.0% | 36.0% | 0.0% | 0.0% | 10.7% |
| 18 | 26.7% | 6.7% | 43.7% | 8.3% | 0.0% | 10.0% | 4.7% | 0.0% | 13.0% |
| 19 | 28.0% | 5.0% | 42.7% | 8.3% | 0.0% | 6.0% | 8.3% | 2.0% | 18.7% |
| 20 | 28.3% | 5.0% | 50.0% | 10.0% | 0.0% | 0.0% | 7.7% | 2.0% | 19.7% |
| 21 | 29.0% | 4.3% | 43.0% | 5.7% | 0.0% | 6.0% | 8.0% | 2.0% | 15.7% |
| 22 | 29.0% | 4.3% | 41.0% | 5.3% | 0.0% | 5.7% | 7.7% | 2.0% | 15.0% |

Table 5 (instant claims 9-22)

Overlapping ranges have been held to be a prima facie case of obviousness, see MPEP §

2144.05. It would have been obvious to one of ordinary skill in the art to select any portion of the range, including the claimed range, from the broader range disclosed in the prior art, because the prior art finds that said composition in the entire disclosed range has a suitable utility.

Because the prior art of Lee teaches an overlapping alloy composition, it is held that Lee has created a prima facie case of obviousness of the presently claimed invention.

Concerning dependent claims 7 and 8, as stated above, Lee teaches that said alloy is substantially a C14 (AB2) Laves phase type crystal structure (abstract).

7. Claims 1-6 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doi et al (US 4,983,474).

Doi teaches (see abstract, column 16 lines 59-64) a hydrogen storage alloy with the following composition, converted from wt% to at%-

| element | weight% | | atomic% | |
|---------|---------|-----|---------|-------|
| Ti | 5 | 25 | 6.3% | 29.3% |
| Mn | 4 | 20 | 4.4% | 20.4% |
| V | 0.1 | 12 | 0.1% | 13.2% |
| Fe | 0.01 | 5 | 0.0% | 5.0% |
| Cr | 0 | 0 | 0.0% | 0.0% |
| Zr | 10 | 37 | 6.6% | 22.7% |
| Ni | 80.88 | 0 | 82.6% | 0.0% |
| Al | 0.01 | 4.5 | 0.0% | 9.3% |

Table 6: Alloy taught by Doi in atomic%

Said composition ranges overlap the composition ranges of instant claims 1-6.

Overlapping ranges have been held to be a prima facie case of obviousness, see MPEP § 2144.05. It would have been obvious to one of ordinary skill in the art to select any portion of the range, including the claimed range, from the broader range disclosed in the prior art, because the prior art finds that said composition in the entire disclosed range has a suitable utility. Therefore it is held that Doi has created a prima facie case of obviousness of the presently claimed invention.

Concerning claim 23, Doi teaches said alloy is in powder form (column 15 lines 49-54).

8. Claims 24-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura in view of Venkatesan et al (US 4,728,586 A).

Concerning claims 24 and 25, Venkatesan et al further teaches that the hydrogen storage alloy powder is pressed or sintered into "the porous metal substrate" (column 5 lines 18-22), in order to form the negative electrode. Said porous metal substrate includes mesh, grid, matte, foil, foam, plate, and expanded metal made out of copper, copper plated nickel or Cu-Ni alloy (column 6 lines 3-4, 9), as presently claimed in claims 26-28. The negative electrode is applicable to prismatic, jelly-rolled, and other battery configurations known to one of ordinary skill in the art (column 7 lines 54-55), as presently claimed in claims 29 and 30. Because both

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Nakamura and Venkatesan et al are drawn to hydrogen storage alloys useful in energy storage for vehicles, it would have been obvious to one of ordinary skill in the art to use the electrode fabrication process, as taught by Venkatesan et al, with the TiMnZr alloy with improved hydrogen absorption ability (Nakamura at column 1 lines 49-57).

Double Patenting

9. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

10. Claims 1-8 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-13 of U.S. Patent No. 6,672,078 B1.

Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of US'078 teach a hydrogen storage alloy consisting of (in at%) 26-32% Ti, 2-5% Zr, 7-10%V, 1-6% Ni, 38-42% Mn, 8-20% Cr, 2-6%Fe, 0.1-2% (see claim 8, etc.), which substantially overlaps the instant alloying ranges (see Table 9 for alloying ranges in atomic % of instant claims 1, 3-6).

| element | claim 1 | | claim 3 | | claim 4 | | claim 5 | | claim 6 | |
|---------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|
| | min at% | max. at% | min at% | max. at% | min at% | max. at% | min at% | max. at% | min at% | max. at% |
| Ti | 9.9% | 73.9% | 12.5% | 70.4% | 13.4% | 70.4% | 11.7% | 61.8% | 12.5% | 58.3% |
| Mn | 0.0% | 65.9% | 0.0% | 61.4% | 0.0% | 60.3% | 0.0% | 55.6% | 0.0% | 51.9% |
| Zr | 0.9% | 28.7% | 1.7% | 16.4% | 1.7% | 12.3% | 1.0% | 23.3% | 1.1% | 21.9% |
| A | 7.0% | 75.0% | 7.3% | 69.2% | 7.4% | 67.9% | 13.0% | 66.7% | 15.2% | 62.5% |
| Cr | 0.0% | 54.5% | 0 | 49.5% | 0 | 48.5% | 0 | 47.8% | 0 | 45.8% |

Table 7: Consolidated Table of instant alloying ranges in at%

The claims of US'078 do not teach said alloy is a single phase material or said alloy exhibits a hexagonal C14 laves phase. However, the examiner asserts that "products of identical chemical composition can not have mutually exclusive properties." *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). A chemical composition and its properties are inseparable. Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims (such as metallurgical structure) are expected to be necessarily present. See MPEP 2112.01.

Because the claims of US'078 teaches a substantially overlapping alloy composition, the rejection is deemed proper.

11. Claims 23-30 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-13 of 6,672,078 B1 in view of Venkatesan et al (US 4,728,586 A).

Concerning claims 23-25, Venkatesan et al further teaches that the hydrogen storage alloy powder is pressed or sintered into "the porous metal substrate" (column 5 lines 18-22), in order to form the negative electrode. Said porous metal substrate includes mesh, grid, matte, foil,

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foam, plate, and expanded metal made out of copper, copper plated nickel or Cu-Ni alloy (column 6 lines 3-4, 9), as presently claimed in claims 26-28. The negative electrode is applicable to prismatic, jelly-rolled, and other battery configurations known to one of ordinary skill in the art (column 7 lines 54-55), as presently claimed in claims 29 and 30. Because both the claims of US'078 and Venkatesan et al are drawn to hydrogen storage alloys useful in energy storage for vehicles, it would have been obvious to one of ordinary skill in the art to use the electrode fabrication process, as taught by Venkatesan et al, with the TiMnZr alloy taught by the claims of US'078.

Response to Arguments/Amendment

12. In the supplemental response filed on October 17, 2003, applicant amended claim 1 and added new claim 31. In the response filed on May 20, 2003, applicant amended claims 1 and 2, and canceled claim 17. The examiner agrees that no new matter has been added.

Applicant's argument that the instant amendment has overcome the rejections in view of Bernauer or "Compilation of IEA/DOE/SNL Hydride Databases" has been found persuasive.

Applicant's argument that the instant amendment has overcome the rejections in view of Nakamura has been partially persuasive. The broad range taught by Nakamura contains Y, which the examiner agrees is excluded by the instant "consisting essentially of" claim language. However, Nakamura teaches comparative examples which do fall within the alloying ranges of instant claims 1-4 (see above for details).

Applicant's argument that the instant amendment has overcome the rejections in view of Fetcenko has been found persuasive.

Allowable Subject Matter

13. Claims 9, 11, 13, 14, and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, and the 112 second paragraph rejection is overcome.

14. The following is a statement of reasons for the indication of allowable subject matter: the prior art does not teach or suggest a hydrogen storage material consisting essentially of the presently claimed alloying ranges.

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

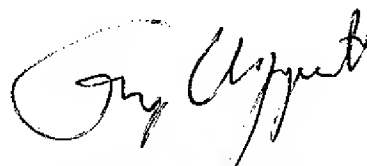
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Janelle Combs-Morillo whose telephone number is (571) 272-1240. The examiner can normally be reached on 8:30 am- 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.


GEORGE W. ZIEMERSKI
FEDERAL TRADE COMMISSION

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January 9, 2004